Identifying the *Cactoblastis cactorum* Pheromone

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Methodology

- gland cuts
- Pheromone Biosynthesis Activating Neuropeptide (PBAN) + gland cuts
- volatile collections

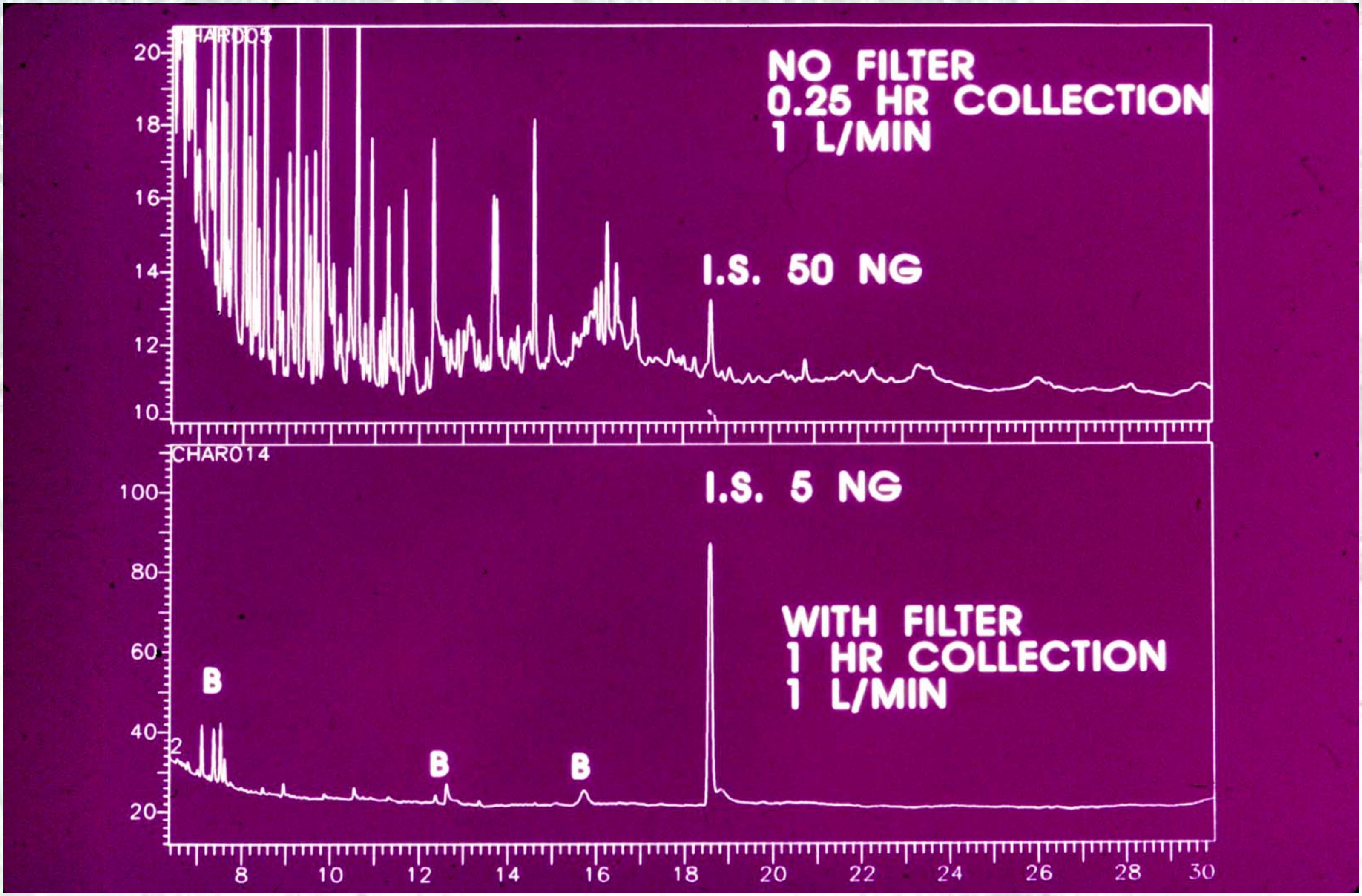
Preferred system

a) chemicals identified from gland cuts (with or without PBAN) do not reflect the release rate or ratio of the pheromone system

b) gland cuts often contain pheromone precursors that may be either not active or inhibitory

Thus, volatile collection is the preferred method

Systems to collect insect semiochemicals
Air must be purified and humidified



Volatile collection apparatus

Collections were made at 1-2 hour intervals From 5:00 a.m. to 8:00 a.m.

Adsorbent traps were extracted with 150 µl of methylene chloride

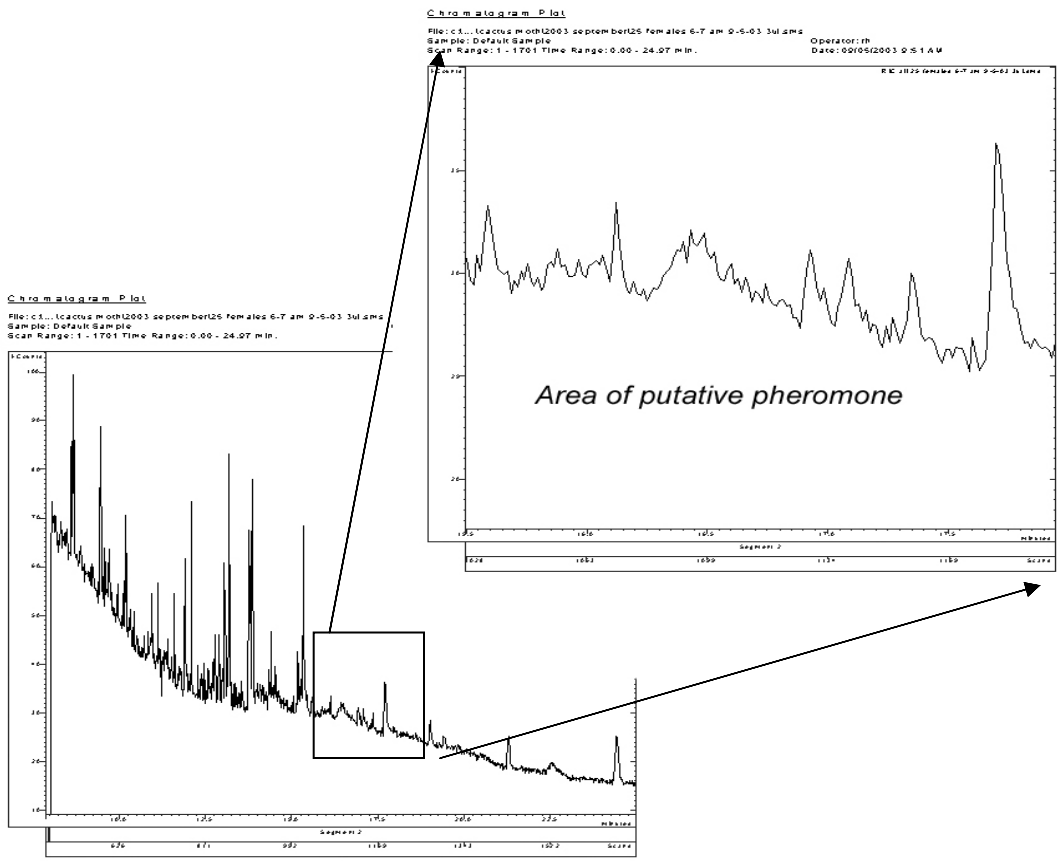
Prior to analysis, the extracted material was concentrated

Concentration may result in loss of active components

Identification process

Using Electron Impact (EI) and Chemical Ionization (CI) with isobutane as the CI reagent

Current status



Best sample to date: putative compounds observed 16 out of 125 times

Flight tunnel bioassay

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Sponsored by the UN, IAEA, Pest Control Division, Dr. Jorge Hendrichs and Dr. Walther Enkerlin

Bioassay procedure

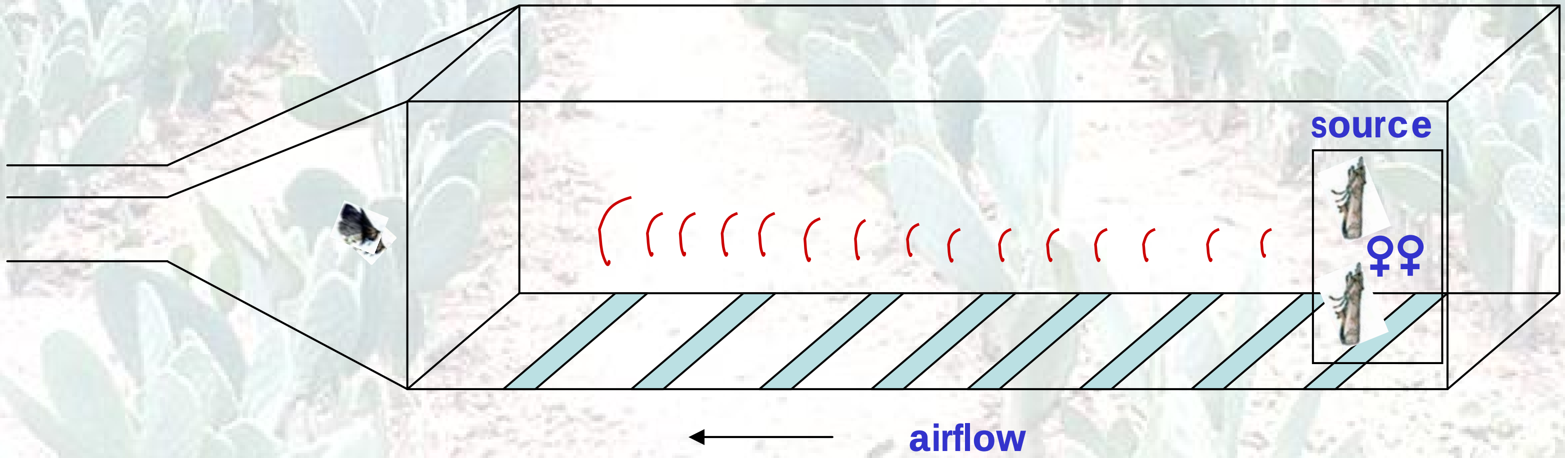
The observations were made in a wind tunnel at 12:12 h photoperiod, 75 ± 5 °F and 80 % RH.

20 males (1-3 days old) were released one by one into the wind tunnel for each treatment.

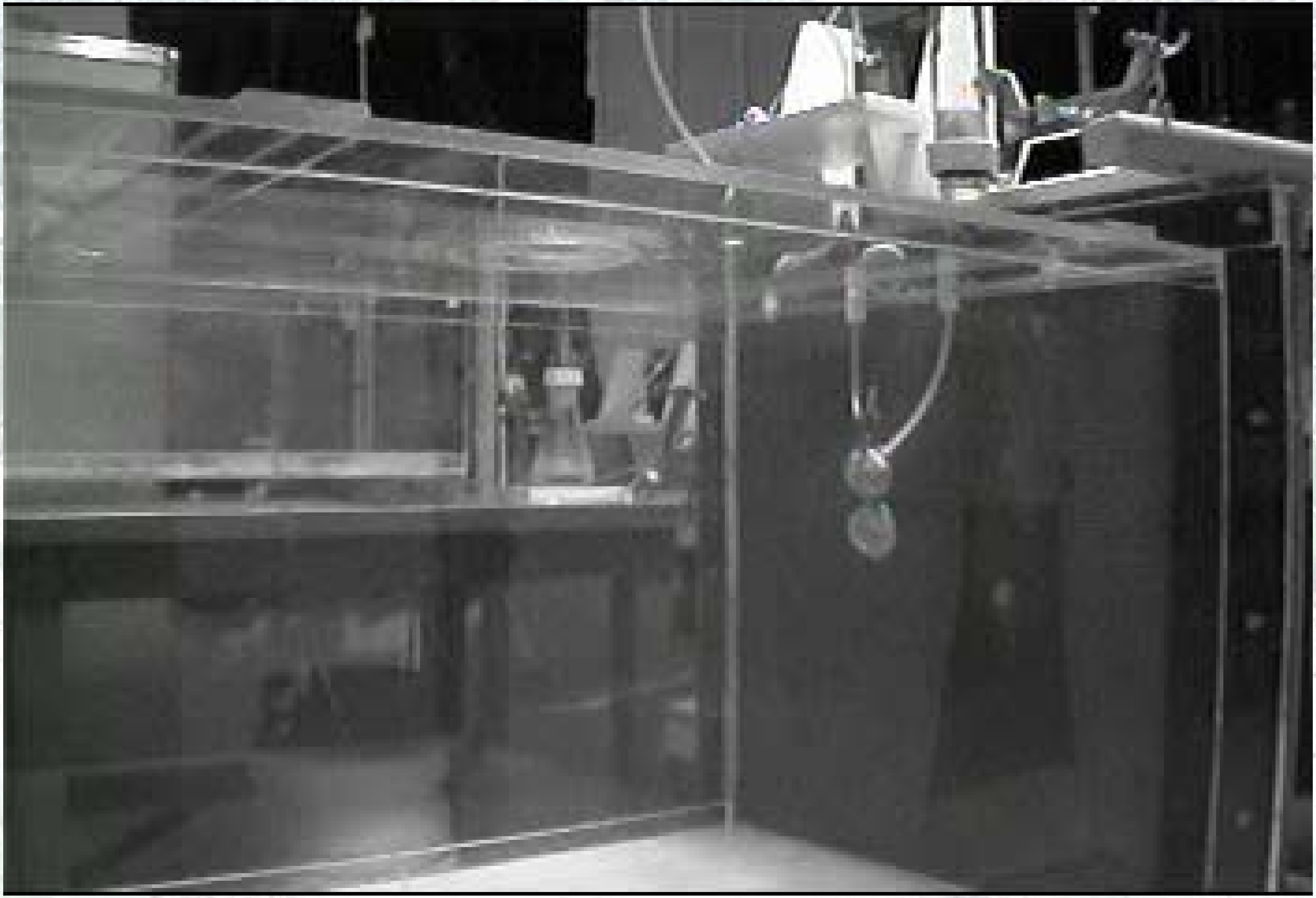
The treatments were: three live virgin females, the gland extract (3 female equivalents) or the septa with different blends (A, B, C, D).

The following behaviors were registered: Oriented Flight (OF) and Landing (LA).

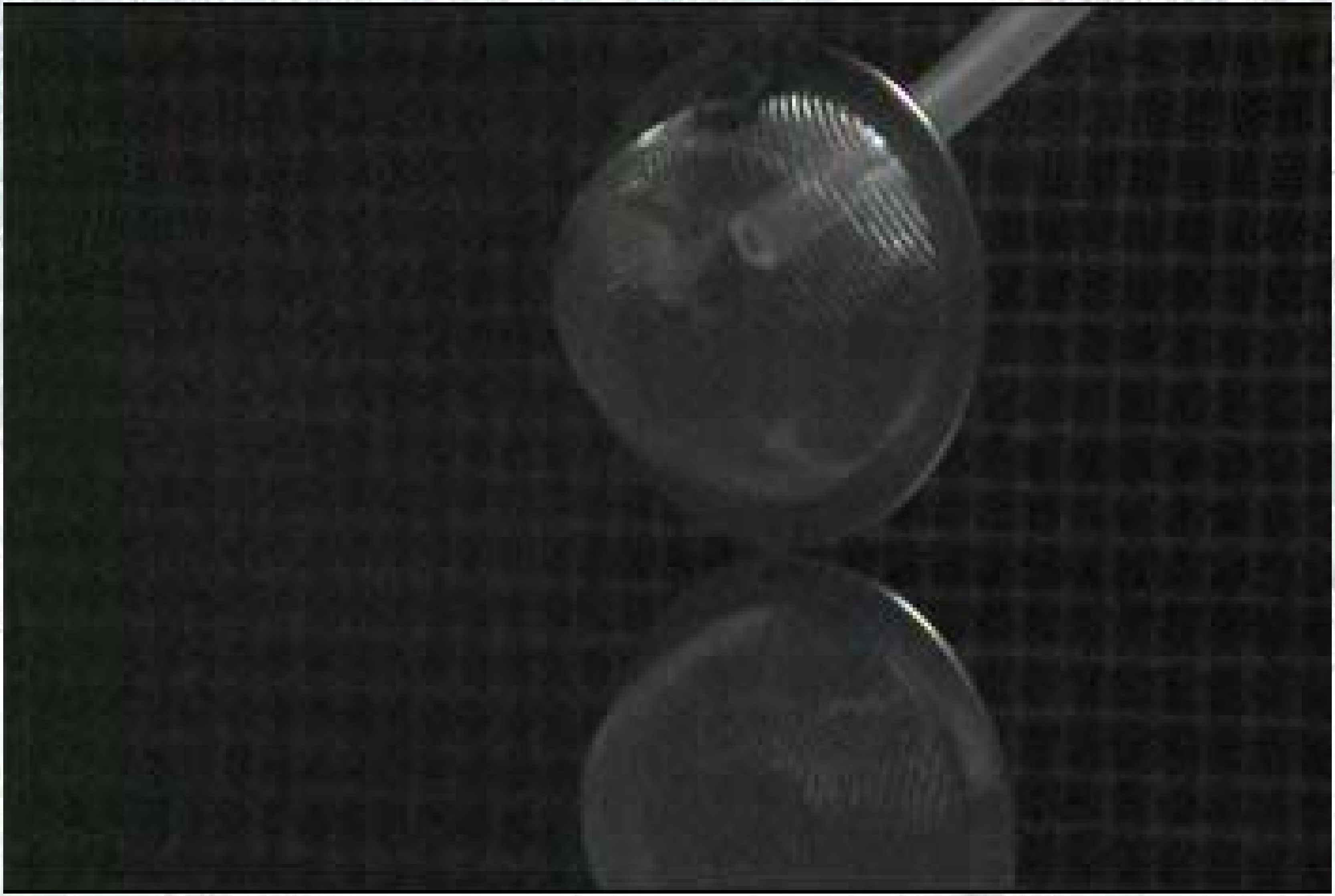
Flight tunnel animation



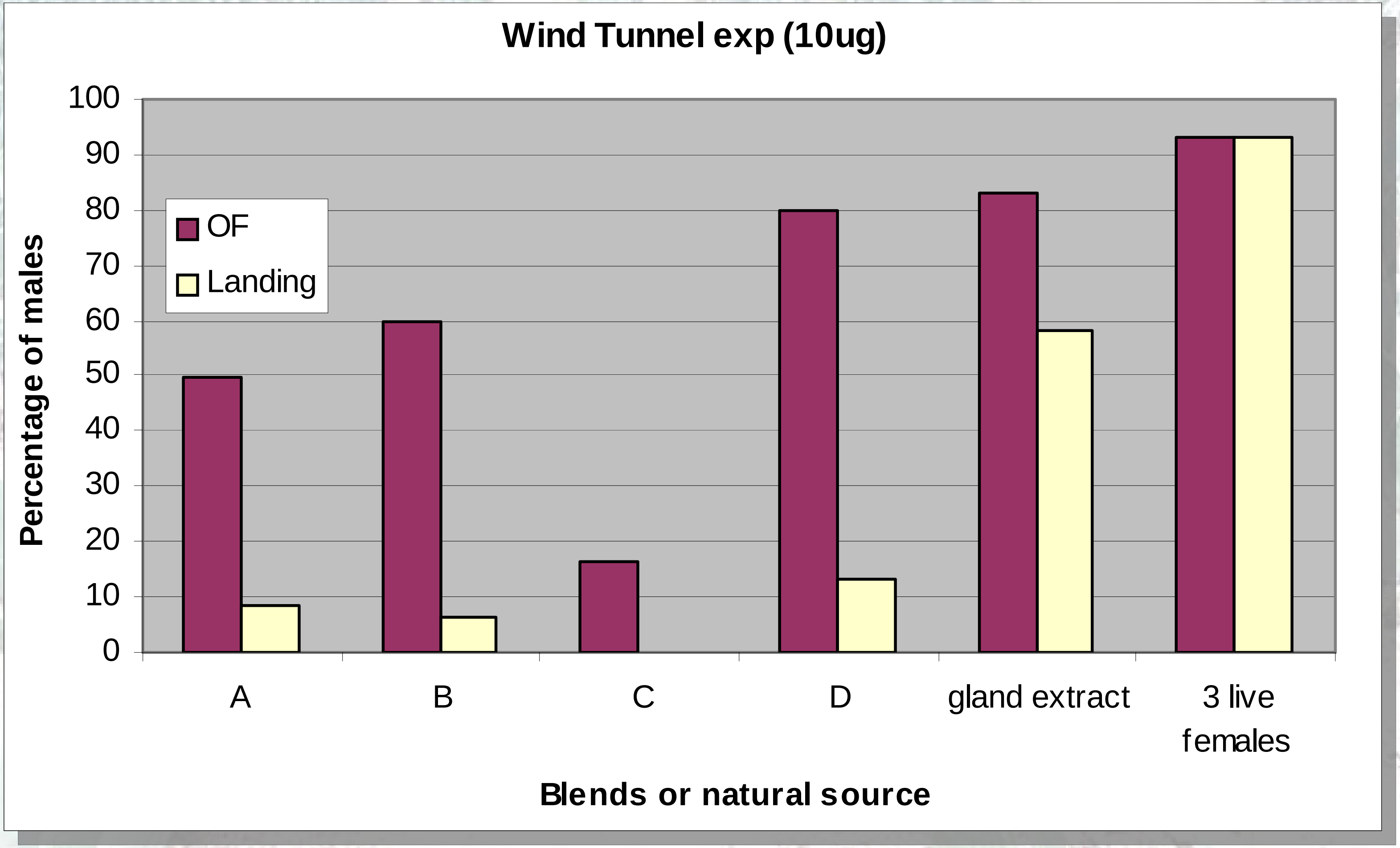
Flight tunnel – oriented flight



Flight tunnel - landing



Bioassay results



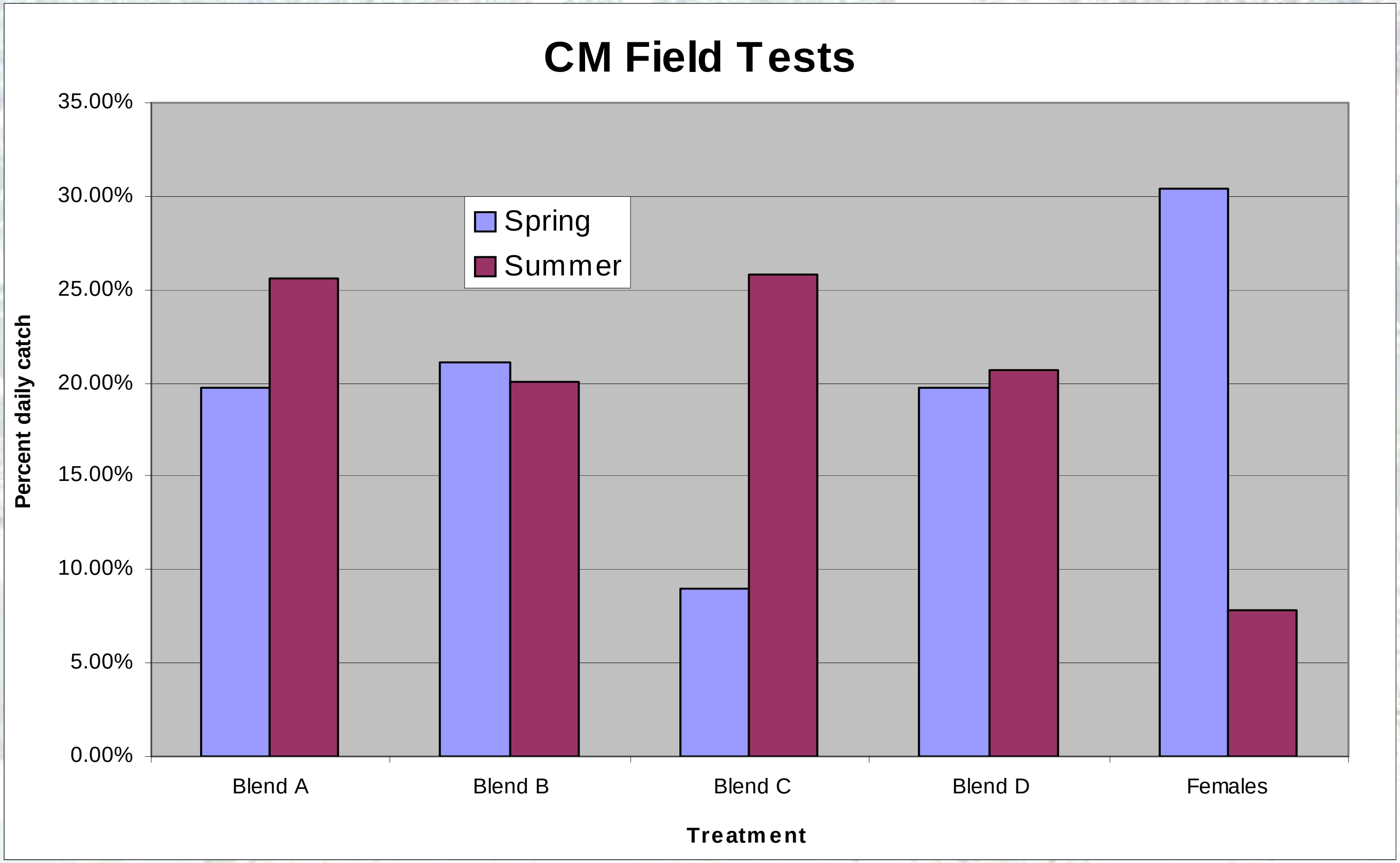
Field Tests

Tests were conducted in collaboration with J. Carpenter, S. Hight, S. Bloem to test capture of cactus moth males in the field.

The treatments were C-traps baited with two live virgin females or septa (blend A, B, C or D) prepared by Suterra LLC (Bend, OR).

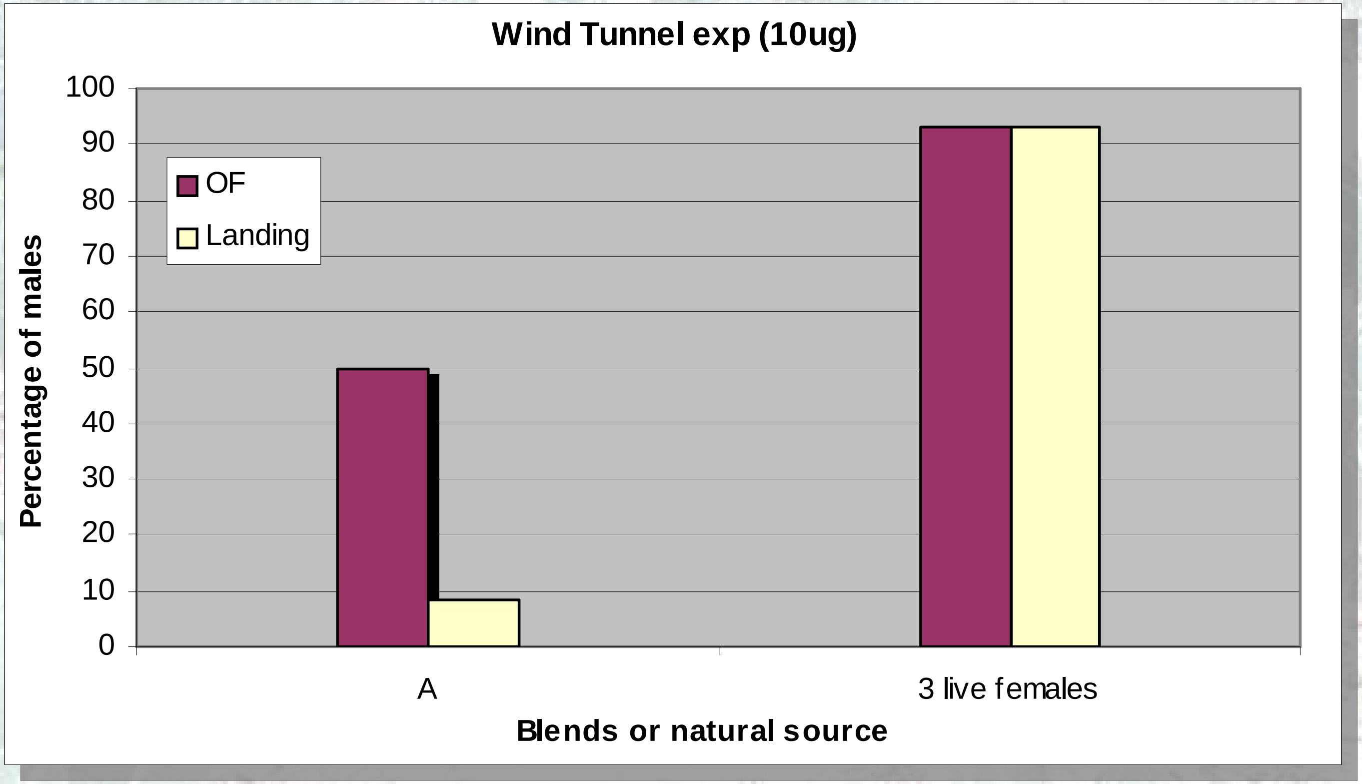
Tests were run in spring (5 reps, 4.5 wk) and summer (5 reps, 5 wk)

Field results



Note: Females are susceptible to environmental conditions...

Conclusion



a) Results speak for themselves. We do not have a complete pheromone system developed.

b) Current experimental system used is blend A

A perspective of the current status of the cactus moth pheromone system

A reality check

The currently identified pheromone based system provides an alternative to using caged female cactus moths to detect moths

The detection capabilities in low population may be severely compromised based on current data

Future 2005

Identify missing components
Determine longevity of lures

Future 2007

Identify missing components
Determine longevity of lures

Not all was lost

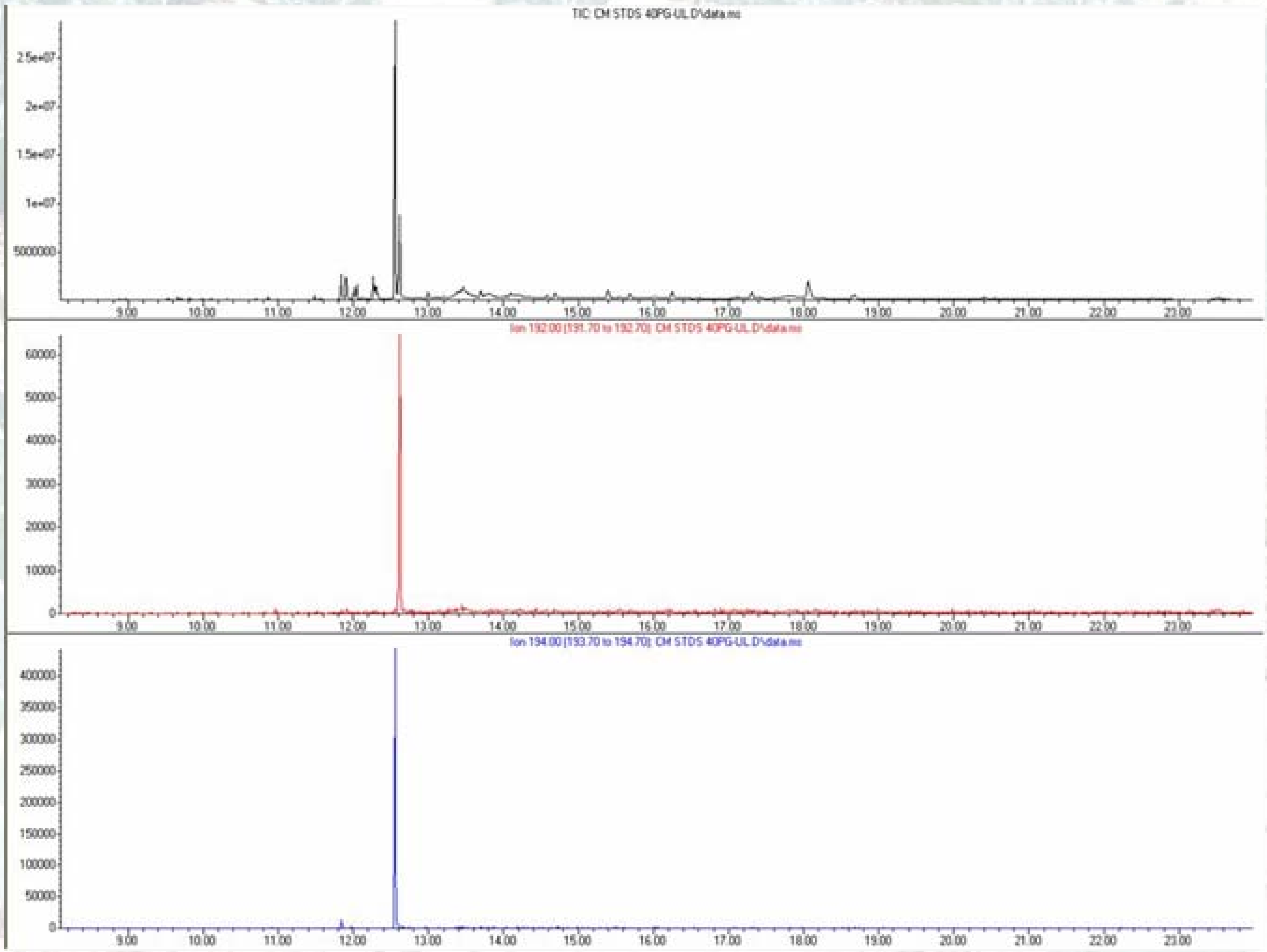
Some significant accomplishments were made

Good news:

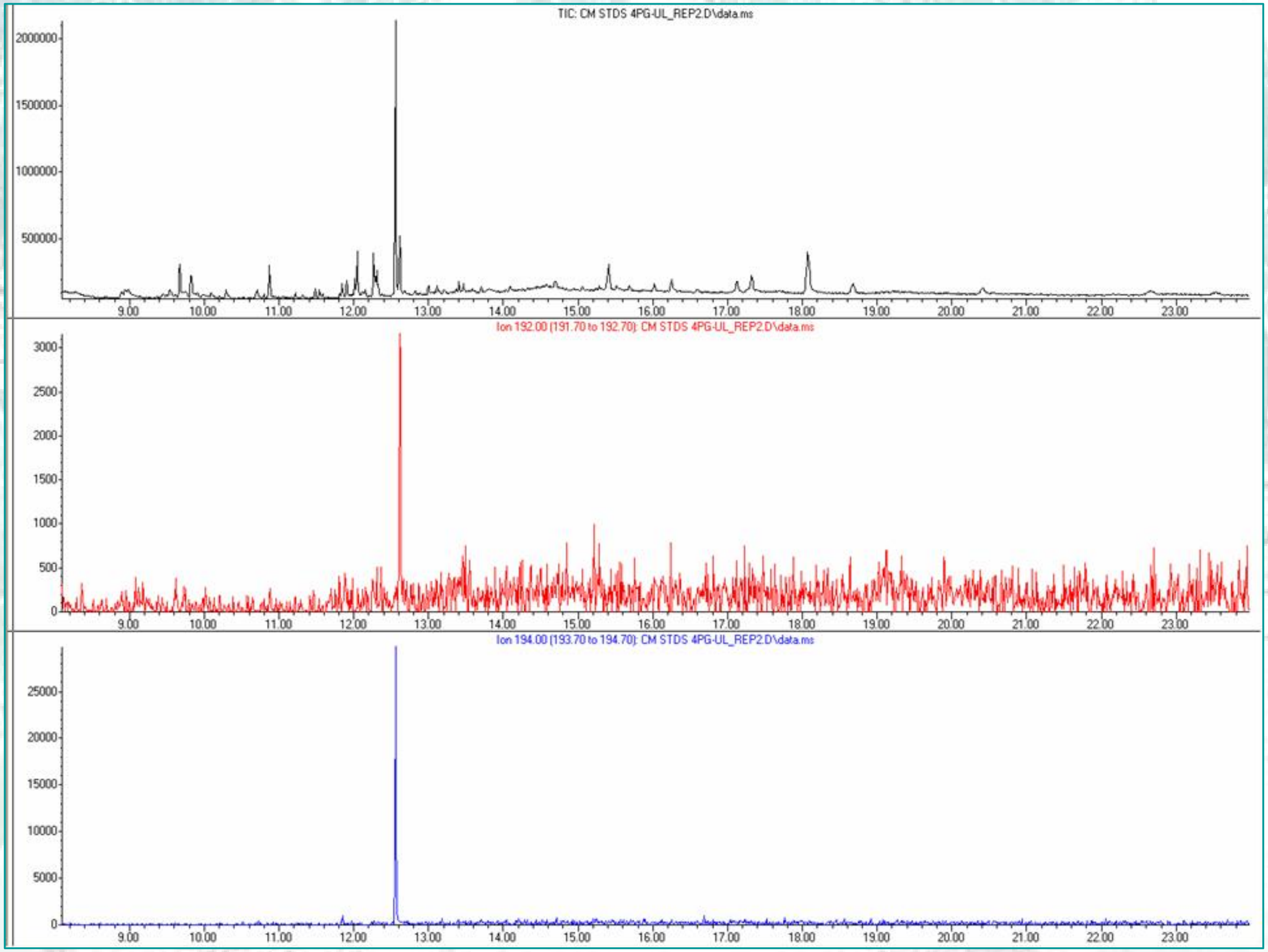
- new GC/MS increased sensitivity of analysis (decrease in amount of material needed)

- previously the amount injected was 2 uL, which required concentrate of sample. Current system permits stackable 25 uL injections so no sample concentration needed

40 pg/uL, 50 uL injected

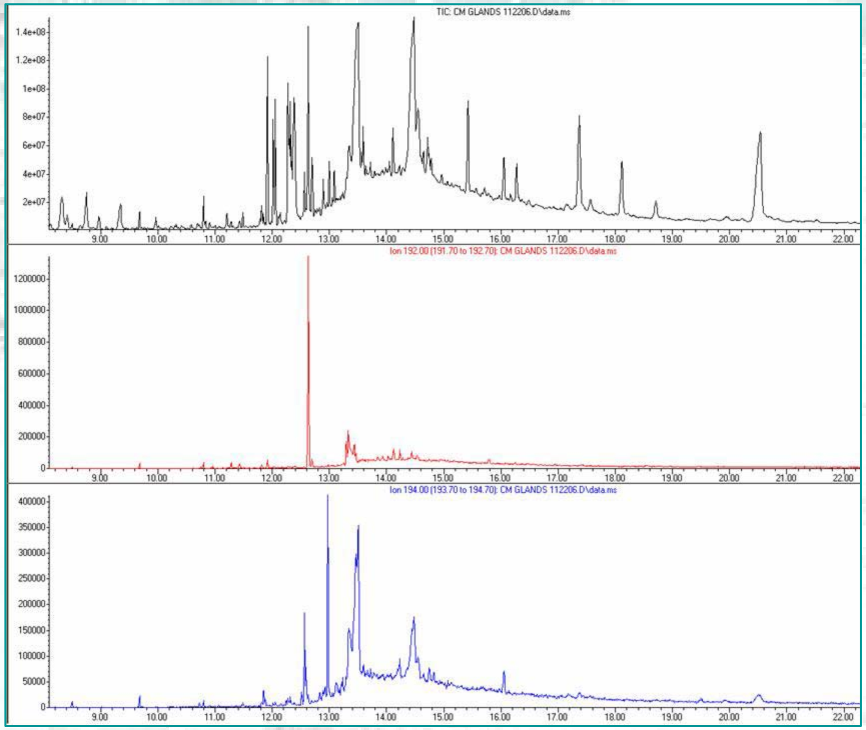


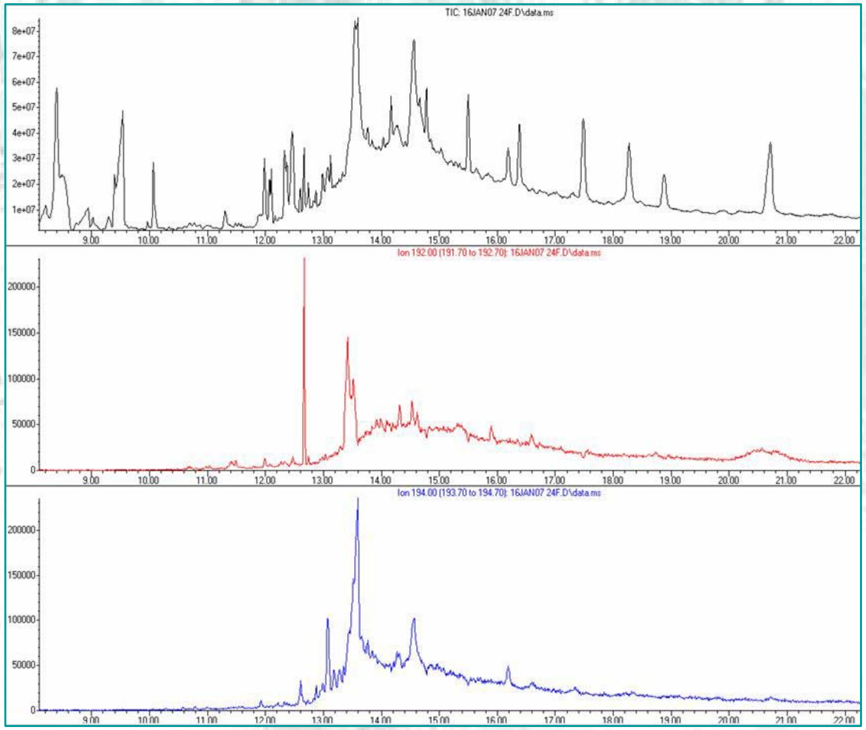
4 pg/uL, 50 uL injected



Oftentimes, with good news,
you get bad news

Although we obtained a significant increase in detection sensitivity with the new GC/MS, we found that gland extracts obtained in January contained considerable less pheromone than those obtained in October

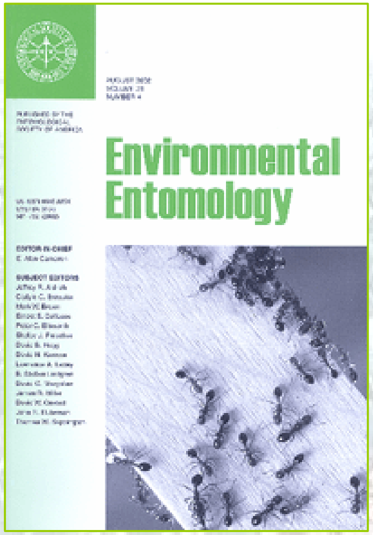




Currently, we are analyzing gland extracts to see if amounts of materials in moths under spring conditions return to levels observed under fall conditions.

If the expected quantities of pheromone are observed in the glands, volatile chemical collections will be made.

If the above fails, a more classical approach may be required. Specifically, this would be to bioassay isolated fractions obtained from gland extracts with the 3 identified compounds.



Pheromone-Based Attractant for Males of *Cactoblastis cactorum* (Lepidoptera: Pyralidae)

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ABSTRACT The cactus moth, *Cactoblastis cactorum* (Berg), is an invasive pest of *Opuntia* spp. Since its arrival in the Florida Keys in 1989, it has moved rapidly up the east and west coasts of Florida, threatening to invade the southwestern United States and Mexico. Female moths produce a sex pheromone that attracts male moths. In this study, we report on mating behavior observed in the laboratory and the identification of putative pheromonal chemical components based on mass spectral analysis of volatiles collected from virgin female moths and from solvent extraction of excised glands. Three candidate components, formulated on rubber septa in different release rates and ratios, were tested in laboratory olfactometer and flight tunnel experiments, and in field tests in areas with known feral populations of cactus moths. Lures formulated with the three-component blend of 54% (*Z,E*)-9,12 tetradecadien-1-ol acetate, 42% (*Z,E*)-9,12 tetradecadien-1-ol, and 4% (*Z*)-9- tetradecen-1-ol acetate were the most effective, although changes in the ratio of these components had little effect on lure efficacy. For field deployment, traps baited with synthetic lures with a 1 mg load of the three component blend captured equal or higher numbers of males than traps baited with two virgin females. Trapping systems using this pheromone-based attractant will be useful for population delineation in areas currently infested.

Paper available for download at www.entsoc.org
Reprints available here from speaker

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